Doing Science Research in Glacier National Park on “Plant Invaders”

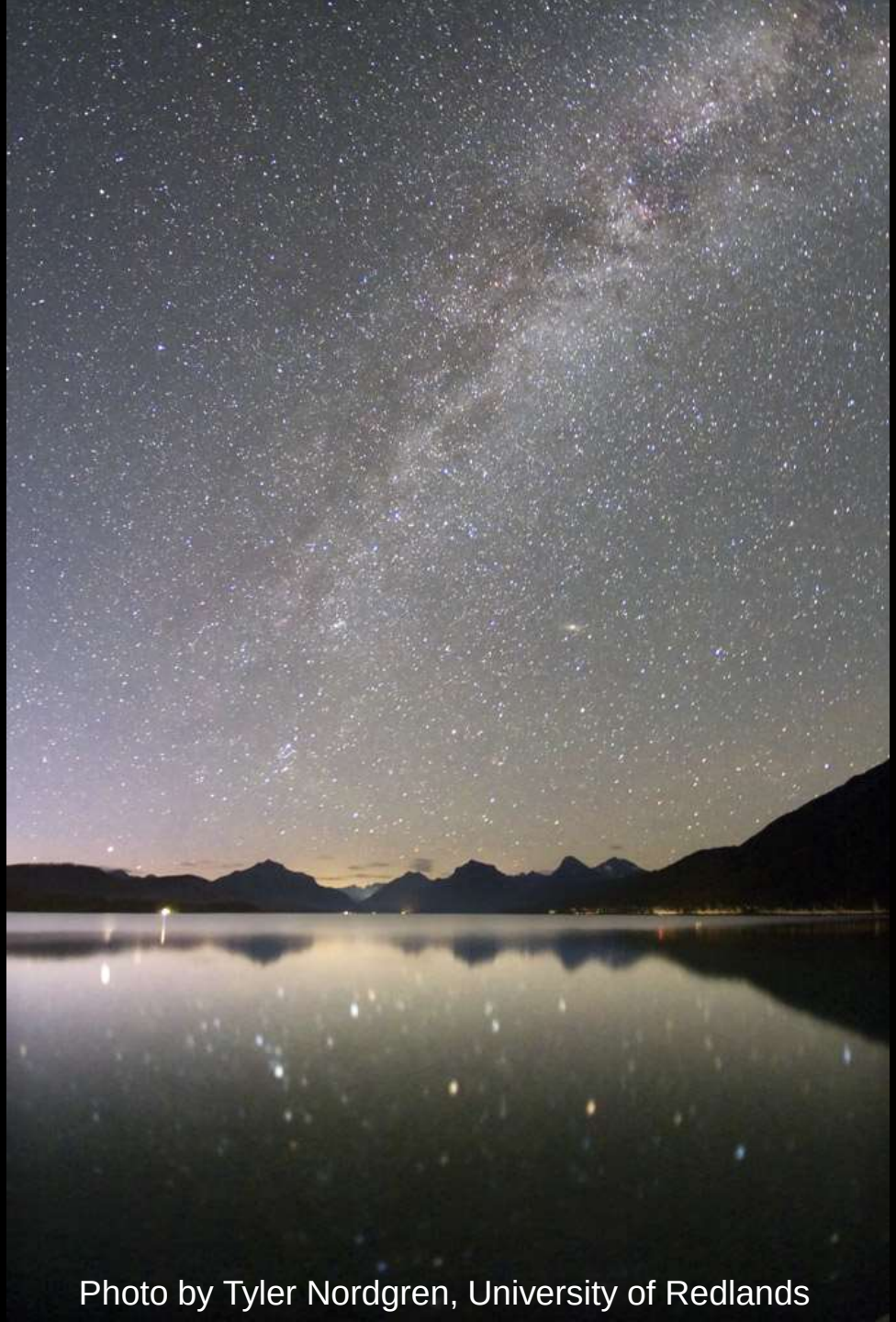
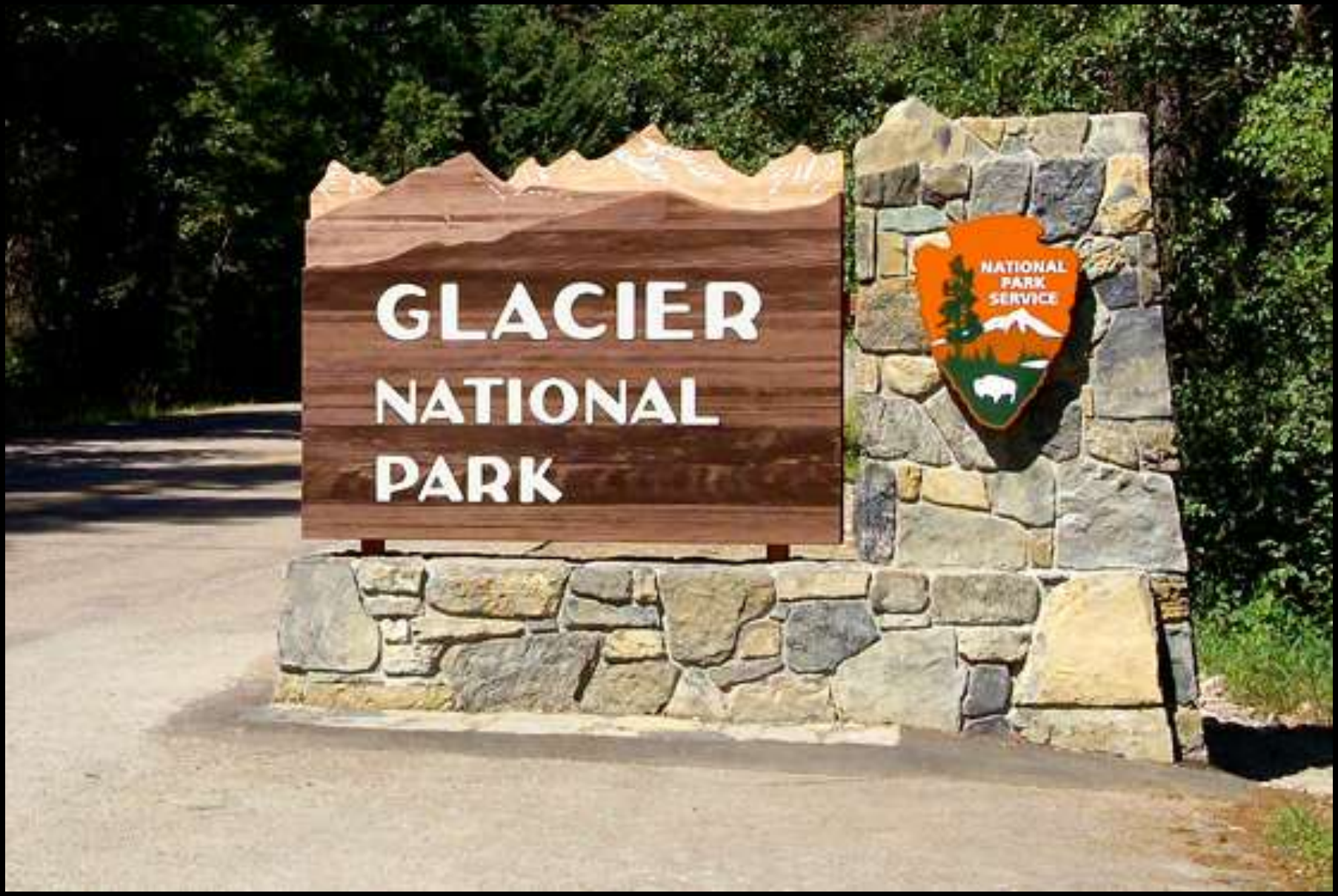


Photo by Tyler Nordgren, University of Redlands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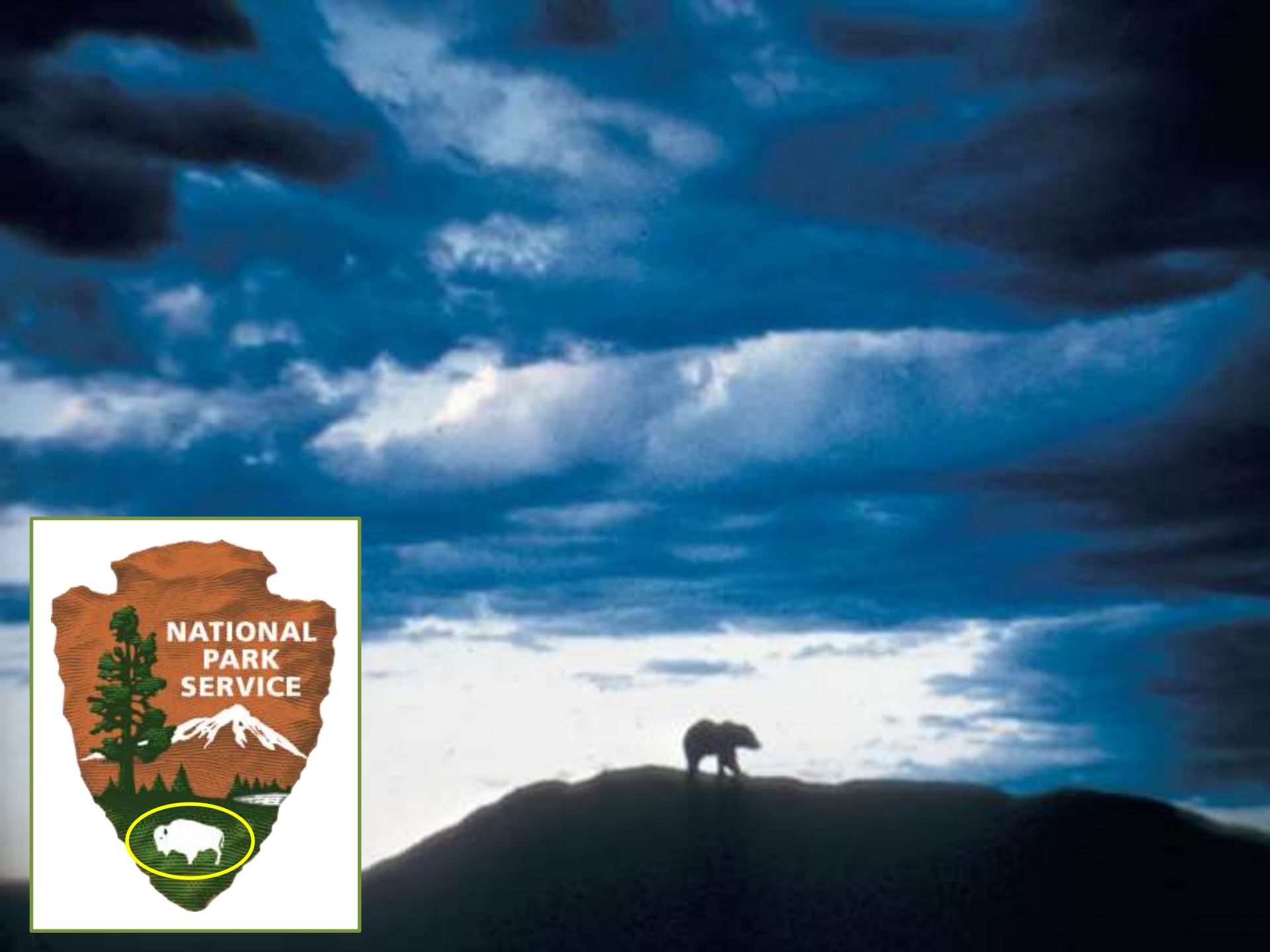
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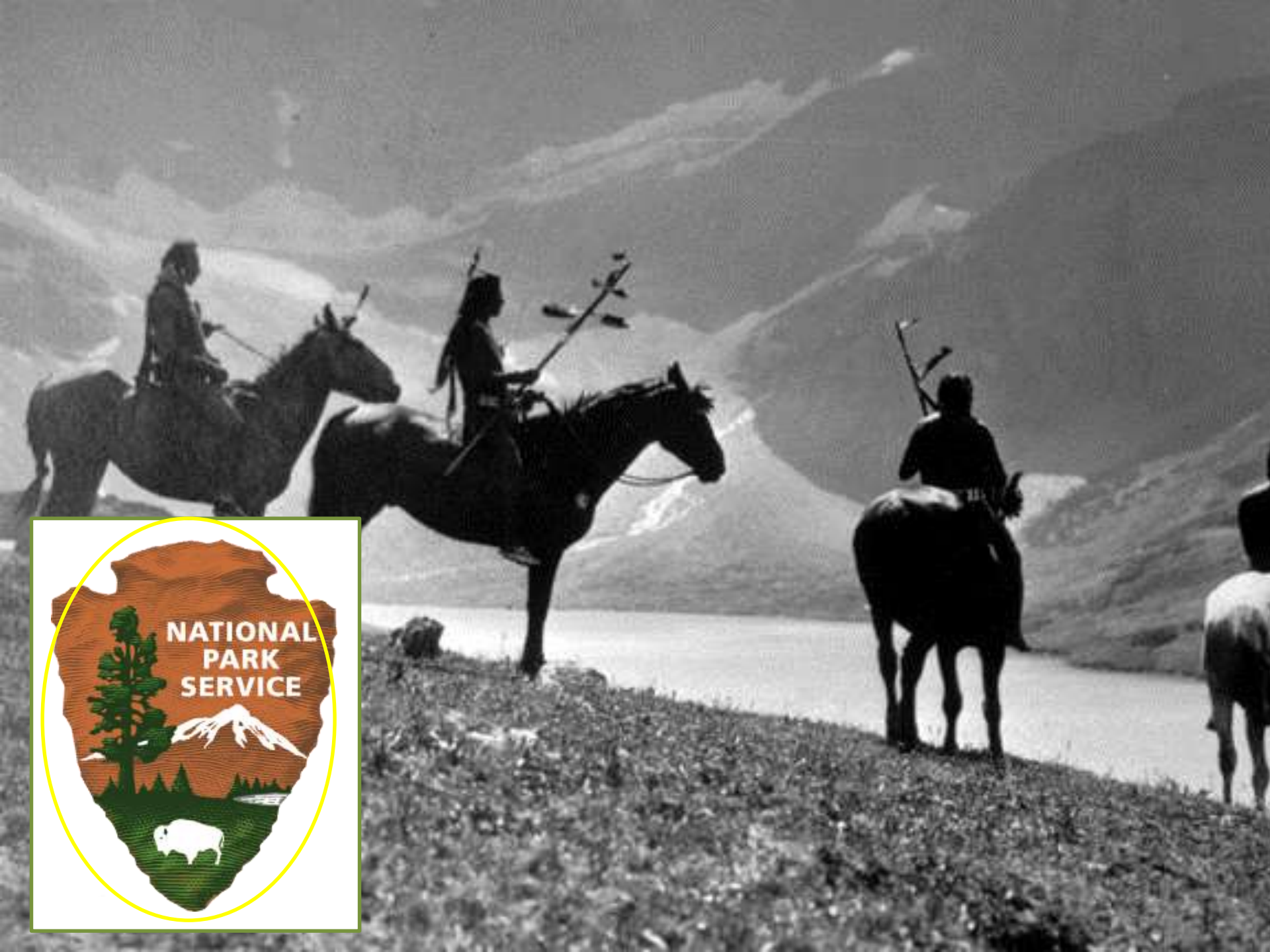
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UNWANTED

INVASIVE SPECIES

Non-Native, Invasive Plants

Toadflax
(Butter and Eggs)

St Johnswort

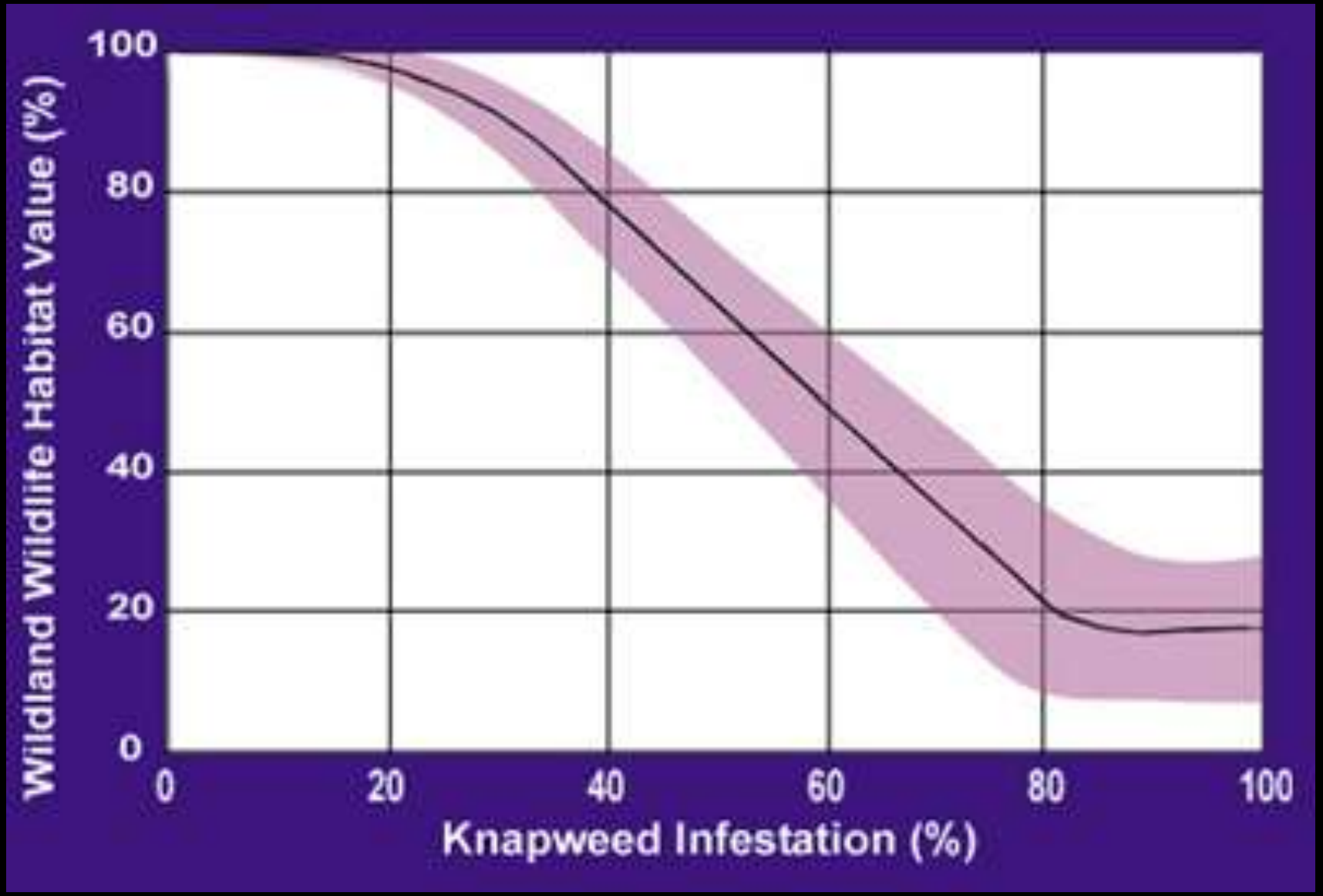
Houndstounge

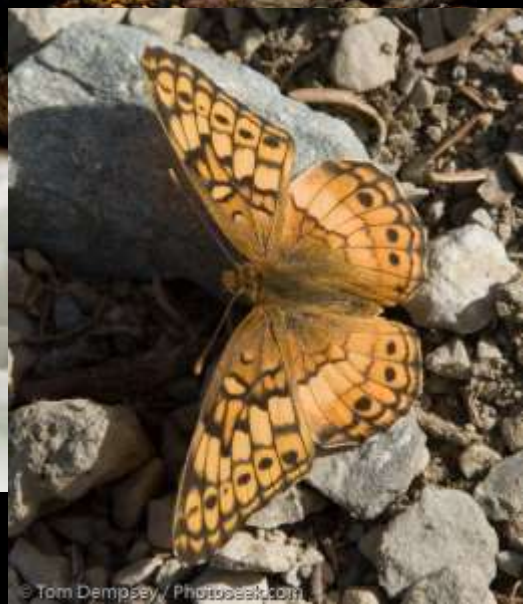
Common Tansy

Spotted Knapweed

Oxeye Daisy


TRUCKCRAFT


Wildland Wildlife Habitat Value (%)
100
80
60
40
20
0
0
20
40
60
80
100
Knapweed Infestation (%)


© Tom Dempsey / Photoseek.com

We Need You!

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park resources
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public benefit.

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GUIDELINES TO RESEARCHERS FOR STUDY PROPOSALS

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MODEL FORM FOR ASSESSMENT OF ACTIONS HAVING AN EFFECT ON CULTURAL RESOURCES

A. **DESCRIPTION OF UNDERTAKING**

1. **Park:** Glacier National Park, West Lakes District Park district (optional)
2. **Work/Project Description:**
   a. Project name High School Data Collection & Monitoring Field Trips with Interpretation & Education Rangers date 9/15/2010 (This will be done with approximately 2 schools each spring and fall) park project #(s)
   b. Describe project and area of potential effects (as defined in 36 CFR Part 800.16(d); explain why work/project is needed

Education rangers will work with high school student groups (<30 students/monitoring site) to collect data on vegetation cover an non-native invasive plant cover along 25 meter transects at two different sites along Lower McDonald Creek. The sites are the old Camp site and the open meadow directly across the creek from the Oxbow. Both sites can be reached by park trails. Students will w in groups of 3 so that there are no more than 6 students along each 25 meter transect (maximum of 5 transects). An adult will be a each transect to help with safety and questions. The students will use ¾ meter quadrats to record vegetation cover and non-native, invasive plant percent cover, every 5 meters along their transect. They will be taking repeat photographs of the quadrats and the tra lines.

This project will help high school students, teachers, and chaperones understand the importance of research and monitoring in Gla National Park. It will focus on non-native, invasive plant monitoring but also the logistics, research design, and concerns associate with field research in a national park (such as this AEF requirement!). The end goals of the project include increasing interest in sci and field research as well as increasing park stewardship of natural and cultural resources.

3. **Has the area of potential effects been surveyed to identify cultural resources?**
   ___ No.
   ___ Yes Source or Reference
   ___ Check here if no known cultural resources will be affected. (If this is because area has been disturbed, please explain attach additional information to show the disturbance was so extensive as to preclude intact cultural deposits.)

4. **Potentially Affected Resource(s):**
   Name and number(s):_____ location:_____ NR status:_
   Name and number(s):_____ location:_____ NR status:
   (REPEAT FOR EACH AFFECTED RESOURCE)

5. **The proposed action will:** (Check as many as apply.)
___ Destroy, remove, or alter features/elements from a historic structure
___ Replace historic features/elements in kind
___ Add nonhistoric features/elements to a historic structure
___ Alter or remove features/elements of a historic setting or environment (inc. terrain)
___ Add nonhistoric features/elements (inc. visual, audible, or atmospheric) to a historic setting or cultural landscape
___ Disturb, destroy, or make archeological resources inaccessible,
___ Disturb, destroy, or make ethnographic resources inaccessible
___ Potentially affect presently unidentified cultural resources
___ Begin or contribute to deterioration of historic features, terrain, setting, landscape elements, or archeological or ethnogra resources
___ Involve a real property transaction (exchange, sale, or lease of land or structures)
___ Other (please specify)

6. **Measures to prevent or minimize loss or impairment of historic/prehistoric properties (Remember that setting, loca and use may be relevant):**

7. **Supporting Study Data:** (attach if feasible; if action is in a plan, EA or EIS, give name and project or page number):

8. **Attachments:** [ ] Maps [ ] Archeological survey, if applicable [ ] Drawings [ ] Specifications [ ] Photographs [ ] Scope of Work [ ] Site plan [ ] List of Materials [ ] Samples
   [ ]Other

Invasive Weed Management Program

Glacier National Park

The Goal
The Plan
The Method

To implement an integrated plant management program to preserve the diversity of native plants

Invasive Weed Management Program

Glacier National Park

The Goal

The Plan

The Method

1. *Inventory non-native plants.*
2. *Research their effects on native plant communities*
3. *Educate people about non-natives*
4. *Stop introduction of new weeds*
5. *Reduce the area affected by invasive exotics using different treatment methods.*

Invasive Weed Management Program

Glacier National Park

The Goal

The Plan

The Method

Inventory *non-natives already here*

Monitor *to see how they are changing plant communities*

Evaluate *the results of monitoring*

Manage *the affected areas with the best treatments*

September 2010

September 2014

Study Site with Location Card and Quadrat

Measurement Tape

GPS Unit

Data Collection Binder

PVC Quadrat pieces

Percentage Cards

Camera

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U.S. Department of the Interior

Glacier National Park

Plant Invaders

Names:	Date:	Transect:
	School:	Quad:
Weather:	Grade:	Location:

Percent Aerial Cover

Round to the nearest 5%. Use size cards to help estimate. The cumulative %Cover should add to 100%. Note anything else you find in the quad (animal tracks, browse, mud puddle, etc.) in the **Notes** *section.*

1. Invasive Plant Species (non-native forbs) Circle all present: Common Tansy Spotted Knapweed Yellow Toadflax Orange Hawkweed Oxeye Daisy Houndstongue	❑ 0% (not present)	❑	%
2. Live Trees/Seedlings Are there trees with a diameter at breast height (DBH) greater than 5cm? (circle one) YES NO If yes, use DBH tape to measure DBH at a height of 1.3 meters for each tree. DBH=_____cm DBH=_____cm Are there trees with a DBH less than 5cm? These are called seedlings. How many seedlings are in the quad? # _____	❑ 0% (not present)	❑	%
3. Live Grass	❑ 0% (not present)	❑	%
4. Duff (decaying plant matter: pine needles, leaves, dead grass, etc)	❑ 0% (not present)	❑	%
5. Dead Wood	❑ 0% (not present)	❑	%
6. Native Forb (broad-leaved flowering plant, no woody stem)	❑ 0% (not present)	❑	%
7. Moss/Lichens/Ferns/Fungi	❑ 0% (not present)	❑	%
8. Bare Rock	❑ 0% (not present)	❑	%
9. Bare Soil/Gravel	❑ 0% (not present)	❑	%
10. Shrub (plant with multiple woody stems)	❑ 0% (not present)	❑	%
Check your Work. The sum of all of the percent cover amounts in #1—10 should add up to 100%.	COVER TOTAL FOR THIS QUAD		%

Notes:

Include any additional information that might be helpful to you or other researchers later on. Are there invasive plant species nearby but not inside your quad? Is there evidence of animal activity along the transect? Did the time of year make it difficult to identify forbs? Have all of the forbs gone to seed?

_____

_____

_____

Photo-Documentation

Each quad needs the following photographs:

Find the laminated white sheet in your transect binder that has your **location, transect letter**, and **quad number**. Place this **card in your quad photograph** so that the bolded information can clearly be seen in the photo.

- ❑ **21a.** From one meter high, zoom in or out so that your quad fills the entire frame and take a photograph ***straight down*** at the center of your quad.

When you are finished accurately and precisely filling out this data sheet take photographs of the front and back. Be sure the image fills the whole frame and all the data can be read when you zoom in.

- ❑ **21b.** Front of data sheet

Each transect needs the following photograph:

- ❑ **21d.** Remind the ranger to take one photo straight down the entire transect

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Glacier National Park

Plant Invaders

Names:	Date:	Transect:
	School:	Quad:
Weather:	Grade:	Location:

Percent Aerial Cover

Round to the nearest 5%. Use size cards to help estimate. The cumulative %Cover should add to 100%. Note anything else you find in the quad (animal tracks, browse, mud puddle, etc.) in the **Notes** *section.*

1. Invasive Plant Species (non-native forbs) Circle all present: Common Tansy Spotted Knapweed Yellow Toadflax Orange Hawkweed Oxeye Daisy Houndstongue	❑ 0% (not present)	❑	%
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3. Live Grass	❑ 0% (not present)	❑	%
4. Duff (decaying plant matter: pine needles, leaves, dead grass, etc)	❑ 0% (not present)	❑	%
5. Dead Wood	❑ 0% (not present)	❑	%
6. Native Forb (broad-leaved flowering plant, no woody stem)	❑ 0% (not present)	❑	%
7. Moss/Lichens/Ferns/Fungi	❑ 0% (not present)	❑	%
8. Bare Rock	❑ 0% (not present)	❑	%
9. Bare Soil/Gravel	❑ 0% (not present)	❑	%
10. Shrub (plant with multiple woody stems)	❑ 0% (not present)	❑	%
Check your Work. The sum of all of the percent cover amounts in #1—10 should add up to 100%.	COVER TOTAL FOR THIS QUAD		%

Notes:

Include any additional information that might be helpful to you or other researchers later on. Are there invasive plant species nearby but not inside your quad? Is there evidence of animal activity along the transect? Did the time of year make it difficult to identify forbs? Have all of the forbs gone to seed?

_____

_____

_____

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U.S. Department of the Interior

Glacier National Park

Plant Invaders

Names:	Date:	Transect: A
	School:	Quad: 10
Weather:	Grade:	Location: Oxbow West

Percent Aerial Cover

Round to the nearest 5%. Use size cards to help estimate. The cumulative %Cover should add to 100%. Note anything else you find in the quad (animal tracks, browse, mud puddle, etc.) in the **Notes** *section.*

1. Invasive Plant Species (non-native forbs)
Circle all present:
Common Tansy Spotted Knapweed Yellow Toadflax
Orange Hawkweed Oxeye Daisy Houndstongue ❑ 0% (not present) ❑ %

2. Live Trees/Seedlings
Are there trees with a diameter at breast height (DBH) greater than 5cm?
(circle one) YES NO
If yes, use DBH ta
tree.
DBH=_____
Are there trees w
many seedlings a

3. Live Grass

4. Duff (decaying

5. Dead Wood

6. Native Forb (bro

7. Moss/Lichens/Fe

8. Bare Rock

9. Bare Soil/Gravel

10. Shrub (plant wit

Check your Work.
The sum of all of th
100%.

Notes:
Include any additio
species nearby but
make it difficult to

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U.S. Department of the Interior

Glacier National Park

Plant Invaders

Names:	Date:	Transect:
	School:	Quad:
Weather:	Grade:	Location:

Percent Aerial Cover

Round to the nearest 5%. Use size cards to help estimate. The cumulative %Cover should add to 100%. Note anything else you find in the quad (animal tracks, browse, mud puddle, etc.) in the **Notes** *section.*

1. Invasive Plant Species (non-native forbs)
Circle all present:
Common Tansy Spotted Knapweed Yellow Toadflax
Orange Hawkweed Oxeye Daisy Houndstongue ❑ 0% (not present) ❑ %

2. Live Trees/Seedlings
Are there trees with a diameter at breast height (DBH) greater than 5cm? (circle one) YES NO
If yes, use DBH tape to measure DBH at a height of 1.3 meters for each tree.
DBH=_____cm DBH=_____cm
Are there trees with a DBH less than 5cm? These are called seedlings. How many seedlings are in the quad? # _____ ❑ 0% (not present) ❑ %

3. Live Grass ❑ 0% (not present) ❑ %

4. Duff (decaying plant matter: pine needles, leaves, dead grass, etc) ❑ 0% (not present) ❑ %

5. Dead Wood ❑ 0% (not present) ❑ %

6. Native Forb (broad-leaved flowering plant, no woody stem) ❑ 0% (not present) ❑ %

7. Moss/Lichens/Ferns/Fungi ❑ 0% (not present) ❑ %

8. Bare Rock ❑ 0% (not present) ❑ %

9. Bare Soil/Gravel ❑ 0% (not present) ❑ %

10. Shrub (plant with multiple woody stems) ❑ 0% (not present) ❑ %

Check your Work.
The sum of all of the percent cover amounts in #1—10 should add up to 100%.

COVER TOTAL FOR THIS QUAD %

Notes:
Include any additional information that might be helpful to you or other researchers later on. Are there invasive plant species nearby but not inside your quad? Is there evidence of animal activity along the transect? Did the time of year make it difficult to identify forbs? Have all of the forbs gone to seed?

_____

_____

_____

- ✓ Bare Rock
- ✓ Bare Soil/Gravel
- ✓ Moss/Lichen/Fern
- ✓ Live Grass
- ✓ Dead Wood
- ✓ Duff
- ✓ Shrub
- ✓ Native Forbs (wildflowers)
- ✓ Non-native, InvasiveForbs
- ✓ Live Trees/Seedlings

Percent Aerial (Canopy) Cover


10%
25%
5%

Aerial Cover

- You can visualize aerial cover by considering a bird's-eye view of the plan. Cover measurements are easiest to make for mosses and matt growing types of plants, but they are applicable for nearly all types of plants.

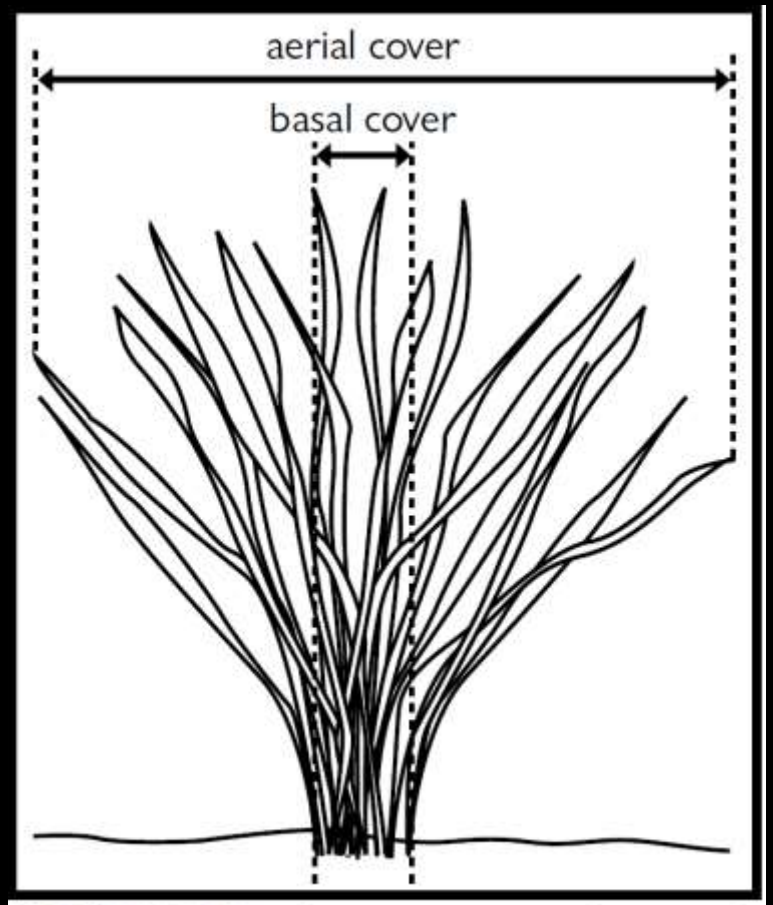

FIGURE 8.7. Basal cover compared to aerial

✓ Bare Rock

No

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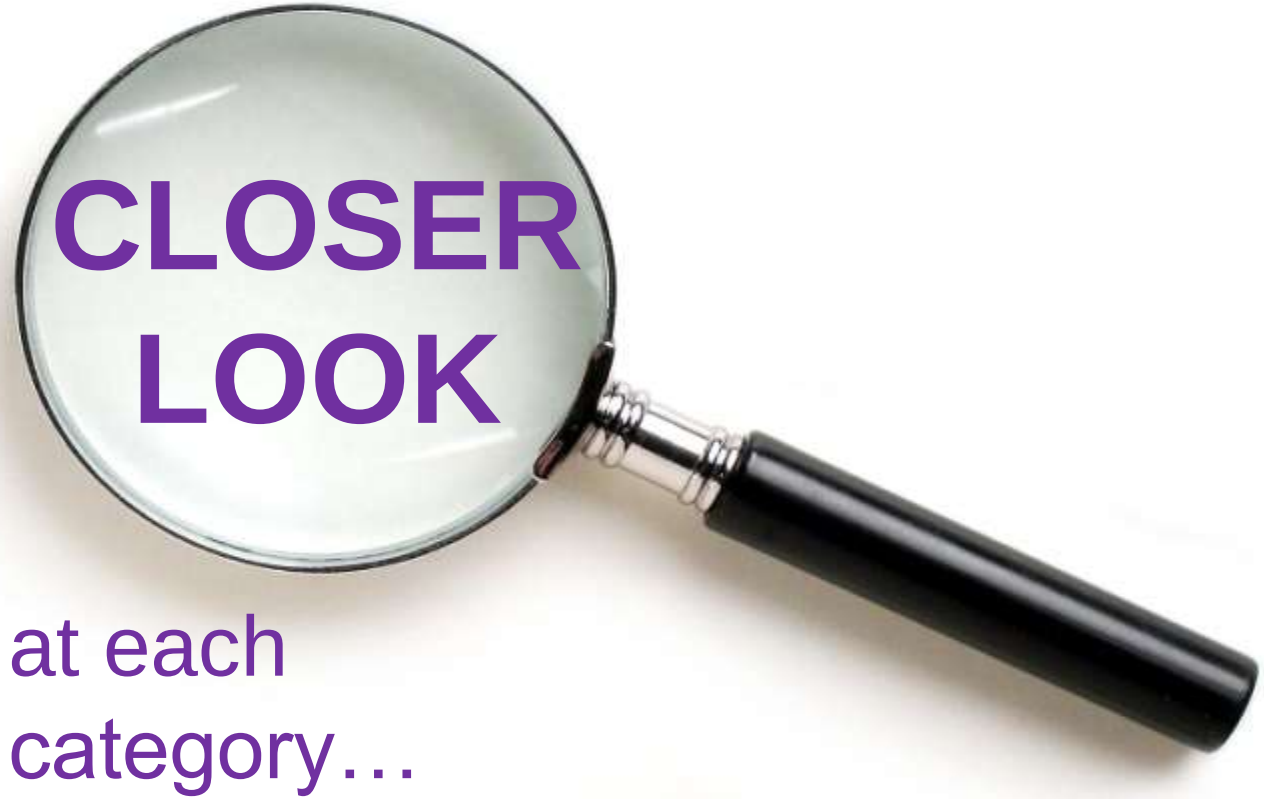
And now for a



at each category…

✓ Bare Soil/Gravel

(with some pine needle duff mixed in.)

✓ Moss/Lichen/Fern

✓ Live **Grass**

In one or several clumps.
composed of slender. narrow leaves

✓ Dead Wood

Any dead or fallen logs on your quadrant standing vertical or fallen horizontal

✓ Duff

Decaying pine needles and leaves piled up on the forest floor.

✓ Shrub

A plant with one or many woody stems that is shorter than a tree

< 2.5 meters

✓ Forb

An herbaceous plant. It does not possess a woody stem above ground. It can produce a flower

Forb; White-Flowered Hawksweed

✓ Trees

Small trees are easy to confuse with shrubs. They both have woody stems but shrubs will often have multiple stems.

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U.S. Department of the Interior

Glacier National Park

Plant Invaders

Names:	Date:	Transect:
	School:	Quad:
Weather:	Grade:	Location:

Percent Aerial Cover

Round to the nearest 5%. Use size cards to help estimate. The cumulative %Cover should add to 100%. Note anything else you find in the quad (animal tracks, browse, mud puddle, etc.) in the **Notes** *section.*

1. Invasive Plant Species (non-native forbs)
Circle all present:
Common Tansy Spotted Knapweed Yellow Toadflax
Orange Hawkweed Oxeye Daisy Houndstongue
❑ 0% (not present) ❑ %

2. Live Trees/Seedlings
Are there trees with a diameter at breast height (DBH) greater than 5cm? (circle one) YES NO
If yes, use DBH tape to measure DBH at a height of 1.3 meters for each tree.
DBH=_____cm DBH=_____cm
Are there trees with a DBH less than 5cm? These are called seedlings. How many seedlings are in the quad? # _____
❑ 0% (not present) ❑ %

3. Live Grass ❑ 0% (not present) ❑ %

4. Duff (decaying plant matter: pine needles, leaves, dead grass, etc) ❑ 0% (not present) ❑ %

5. Dead Wood ❑ 0% (not present) ❑ %

6. Native Forb (broad-leaved flowering plant, no woody stem) ❑ 0% (not present) ❑ %

7. Moss/Lichens/Ferns/Fungi ❑ 0% (not present) ❑ %

8. Bare Rock ❑ 0% (not present) ❑ %

9. Bare Soil/Gravel ❑ 0% (not present) ❑ %

10. Shrub (plant with multiple woody stems) ❑ 0% (not present) ❑ %

Check your Work.
The sum of all of the percent cover amounts in #1—10 should add up to 100%.

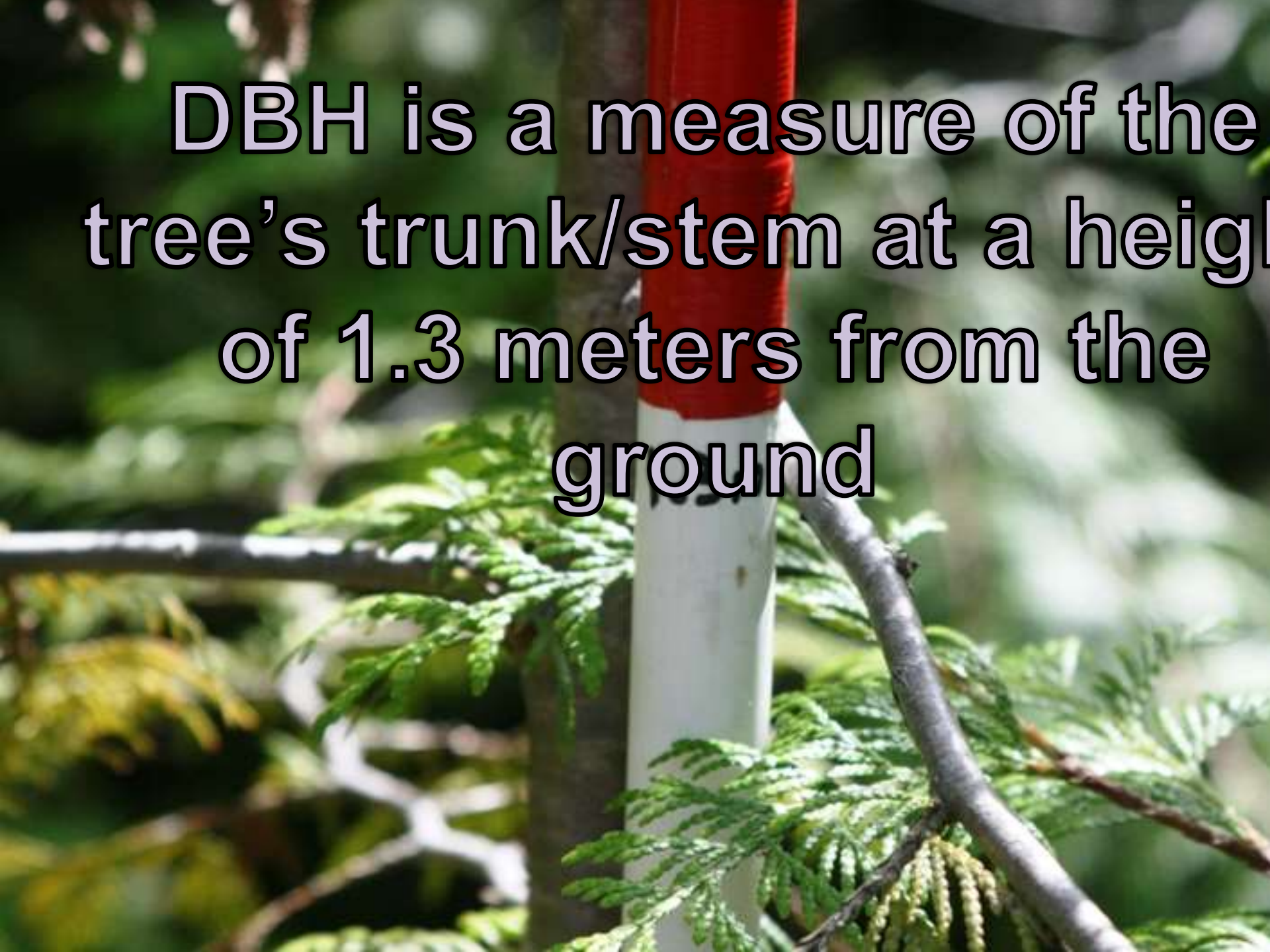
COVER TOTAL FOR THIS QUAD %

Notes:
Include any additional information that might be helpful to you or other researchers later on. Are there invasive plant species nearby but not inside your quad? Is there evidence of animal activity along the transect? Did the time of year make it difficult to identify forbs? Have all of the forbs gone to seed?

_____

_____

_____


DBH is a measure of the
tree's trunk/stem at a heig
of 1.3 meters from the
ground


Ex. DBH=22.4 cm
23
22
21
20

National Park Service
U.S. Department of the Interior

Glacier National Park

Plant Invaders

Names:	Date:	Transect:
	School:	Quad:
Weather:	Grade:	Location:

Percent Aerial Cover

Round to the nearest 5%. Use size cards to help estimate. The cumulative %Cover should add to 100%. Note anything else you find in the quad (animal tracks, browse, mud puddle, etc.) in the **Notes** *section.*

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Circle all present:
Common Tansy Spotted Knapweed Yellow Toadflax
Orange Hawkweed Oxeye Daisy Houndstongue
❑ 0% (not present) ❑ %

2. Live Trees/Seedlings
Are there trees with a diameter at breast height (DBH) greater than 5cm? (circle one) YES NO
If yes, use DBH tape to measure DBH at a height of 1.3 meters for each tree.
DBH=_____cm DBH=_____cm
Are there trees with a DBH less than 5cm? These are called seedlings. How many seedlings are in the quad? # _____
❑ 0% (not present) ❑ %

3. Live Grass ❑ 0% (not present) ❑ %

4. Duff (decaying plant matter: pine needles, leaves, dead grass, etc) ❑ 0% (not present) ❑ %

5. Dead Wood ❑ 0% (not present) ❑ %

6. Native Forb (broad-leaved flowering plant, no woody stem) ❑ 0% (not present) ❑ %

7. Moss/Lichens/Ferns/Fungi ❑ 0% (not present) ❑ %

8. Bare Rock ❑ 0% (not present) ❑ %

9. Bare Soil/Gravel ❑ 0% (not present) ❑ %

10. Shrub (plant with multiple woody stems) ❑ 0% (not present) ❑ %

Check your Work.
The sum of all of the percent cover amounts in #1—10 should add up to 100%.

COVER TOTAL FOR THIS QUAD %

Notes:
Include any additional information that might be helpful to you or other researchers later on. Are there invasive plant species nearby but not inside your quad? Is there evidence of animal activity along the transect? Did the time of year make it difficult to identify forbs? Have all of the forbs gone to seed?

_____

_____

_____

Photo-Documentation

Each quad needs the following photographs:

Find the laminated white sheet in your transect binder that has your **location, transect letter**, and **quad number**. Place this **card in your quad photograph** so that the bolded information can clearly be seen in the photo.

- ❑ **21a.** From one meter high, zoom in or out so that your quad fills the entire frame and take a photograph ***straight down*** at the center of your quad.

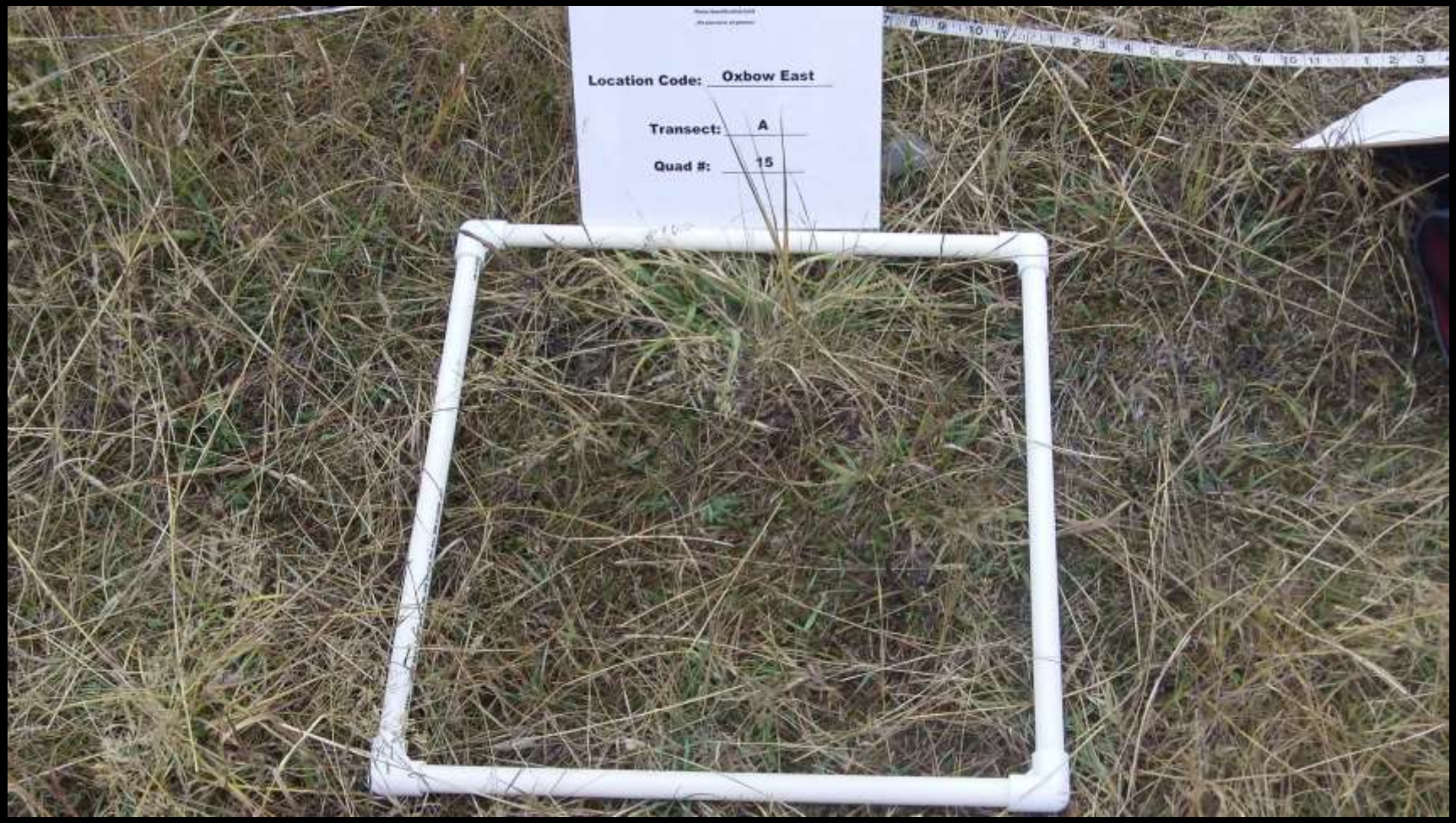
When you are finished accurately and precisely filling out this data sheet take photographs of the front and back. Be sure the image fills the whole frame and all the data can be read when you zoom in.

- ❑ **21b.** Front of data sheet

Each transect needs the following photograph:

- ❑ **21d.** Remind the ranger to take one photo straight down the entire transect

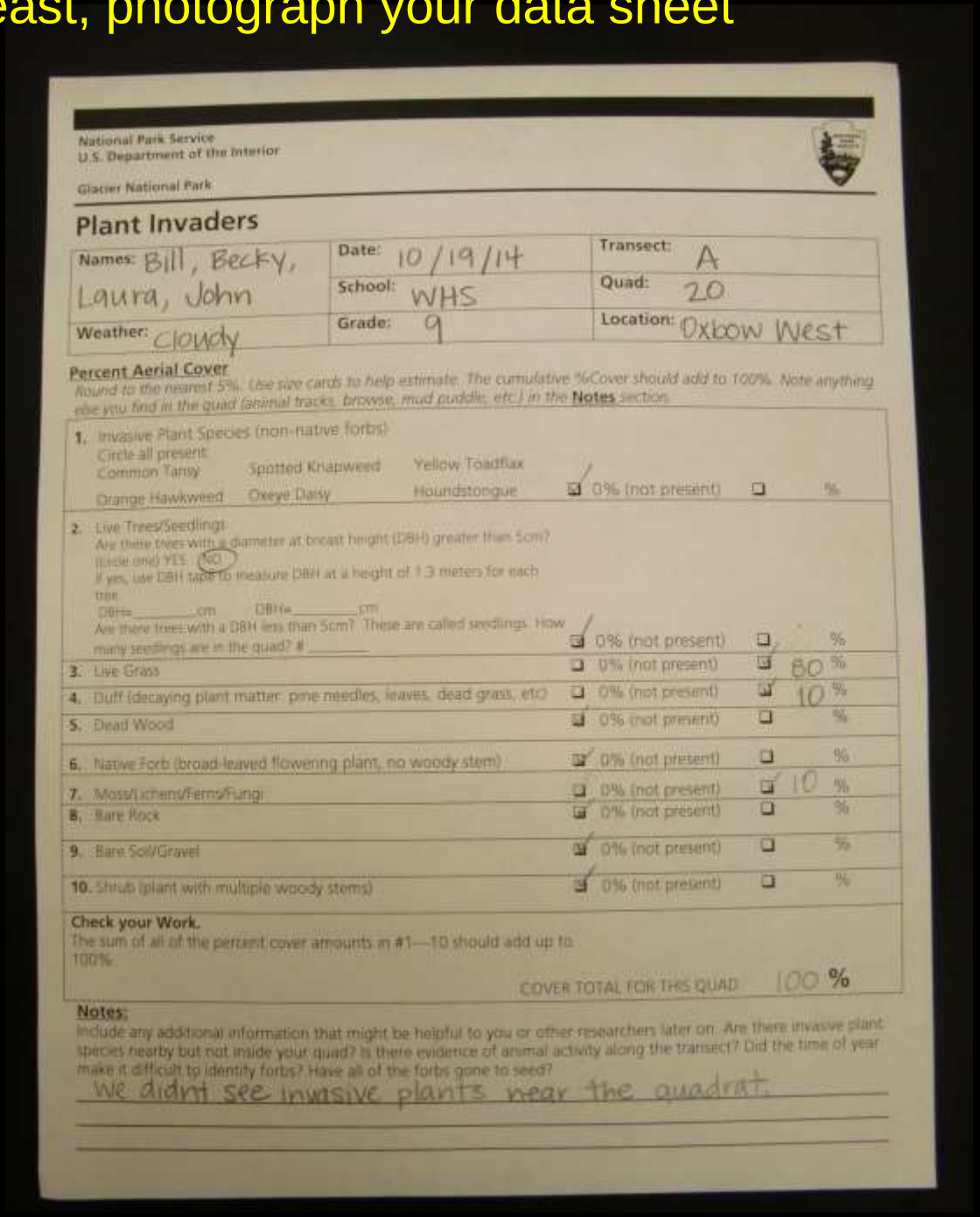
Zoom out to make sure the Photo ID card and all of your quadrant can be seen in the picture



What is wrong with this picture?

What is wrong with this picture?

Last but not least, photograph your data sheet



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U.S. Department of the Interior

Glacier National Park

Plant Invaders

Names: Bill, Becky, Laura, John	Date: 10/19/14	Transect: A
	School: WHS	Quad: 20
Weather: cloudy	Grade: 9	Location: Oxbow West

Percent Aerial Cover

Round to the nearest 5%. Use size cards to help estimate. The cumulative %Cover should add to 100%. Note anything else you find in the quad (animal tracks, browse, mud puddle, etc.) in the **Notes** *section.*

1. Invasive Plant Species (non-native forbs) Circle all present: Common Tansy, Spotted Knapweed, Yellow Toadflax, Orange Hawkweed, Oxeye Daisy, Houndstongue	☑ 0% (not present)	☐ %
2. Live Trees/Seedlings Are there trees with a diameter at breast height (DBH) greater than 5cm? (circle one) YES (NO) If yes, use DBH tape to measure DBH at a height of 1.3 meters for each tree. DBH= ____cm DBH= ____cm Are there trees with a DBH less than 5cm? These are called seedlings. How many seedlings are in the quad? # ____	☑ 0% (not present)	☐ %
3. Live Grass	☐ 0% (not present)	☑ 80 %
4. Duff (decaying plant matter: pine needles, leaves, dead grass, etc)	☐ 0% (not present)	☑ 10 %
5. Dead Wood	☑ 0% (not present)	☐ %
6. Native Forb (broad-leaved flowering plant, no woody stem)	☑ 0% (not present)	☐ %
7. Moss/Lichens/Ferns/Fungi	☐ 0% (not present)	☑ 10 %
8. Bare Rock	☑ 0% (not present)	☐ %
9. Bare Soil/Gravel	☑ 0% (not present)	☐ %
10. Shrub (plant with multiple woody stems)	☑ 0% (not present)	☐ %

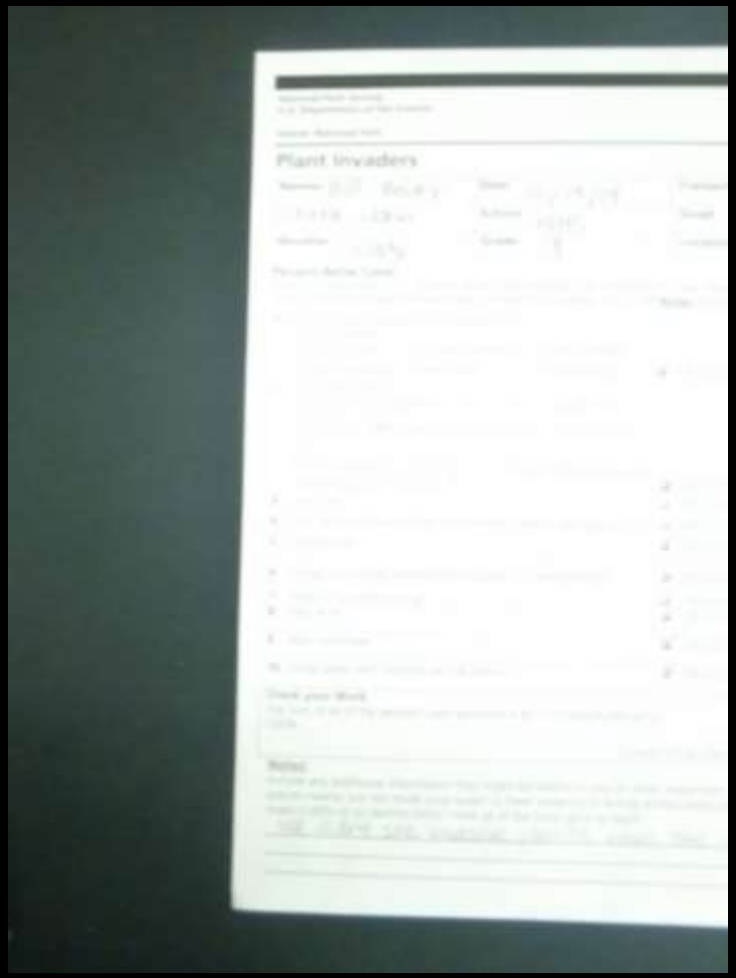
Check your Work.
The sum of all of the percent cover amounts in #1—10 should add up to 100%.

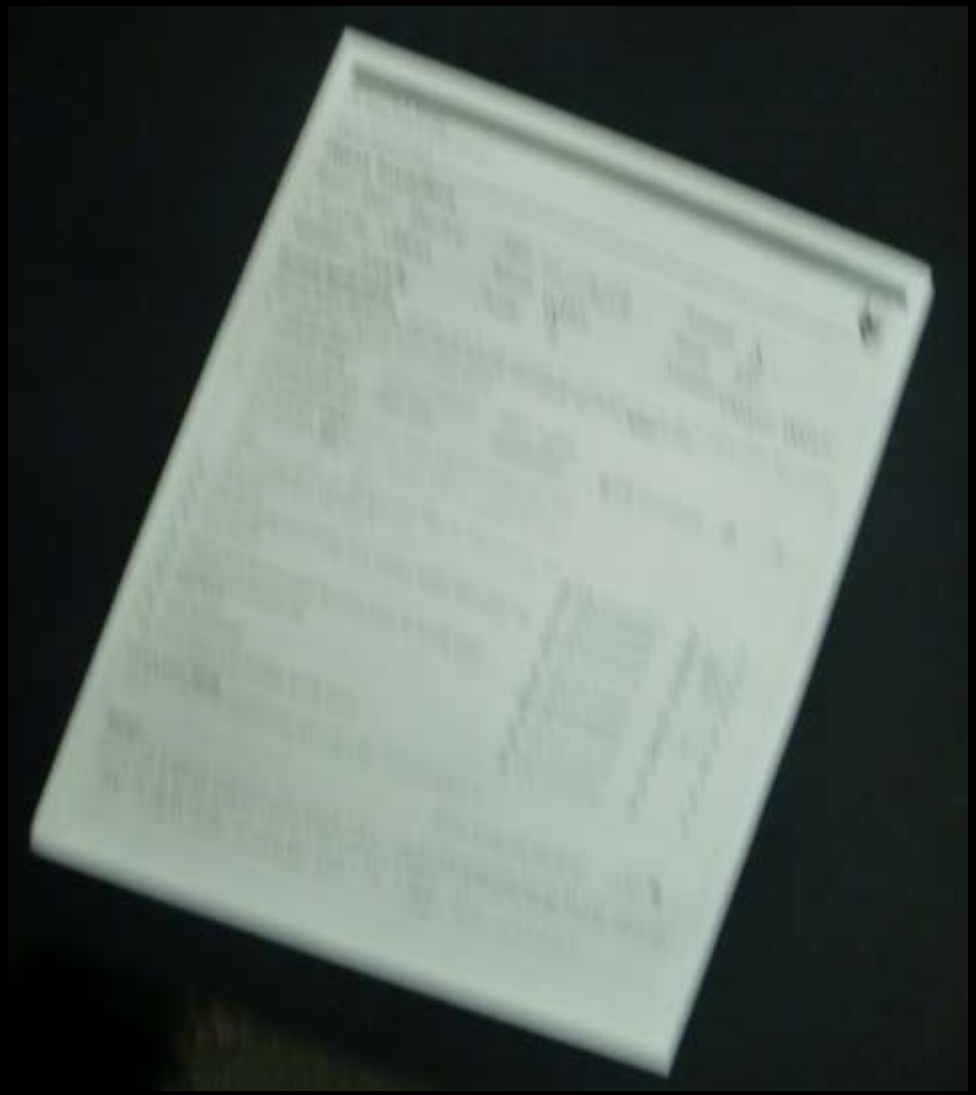
COVER TOTAL FOR THIS QUAD 100 %

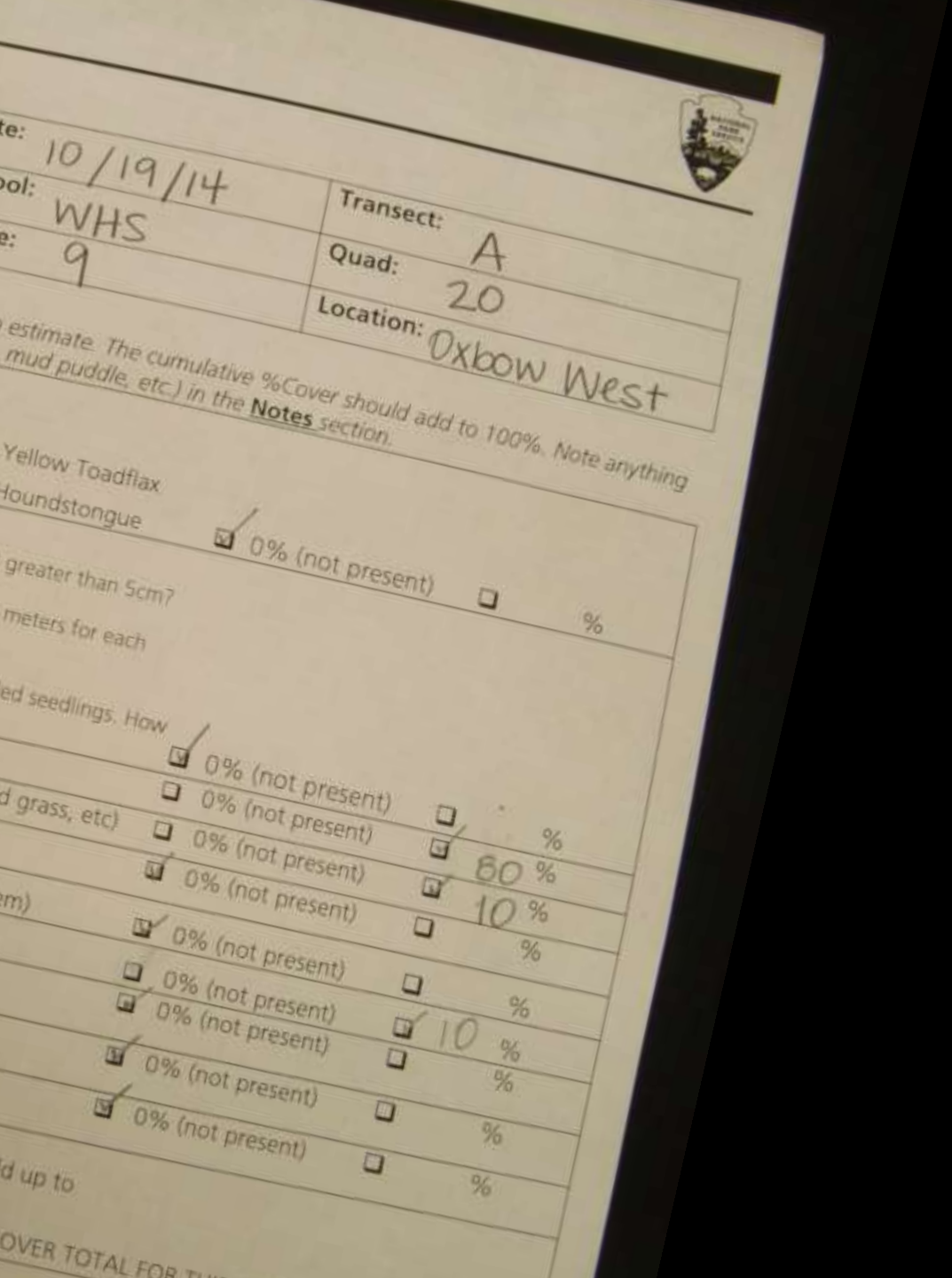
Notes:
Include any additional information that might be helpful to you or other researchers later on. Are there invasive plant species nearby but not inside your quad? Is there evidence of animal activity along the transect? Did the time of year make it difficult to identify forbs? Have all of the forbs gone to seed?

We didnt see invasive plants near the quadrat.

How **NOT** to take a picture of your data sheet



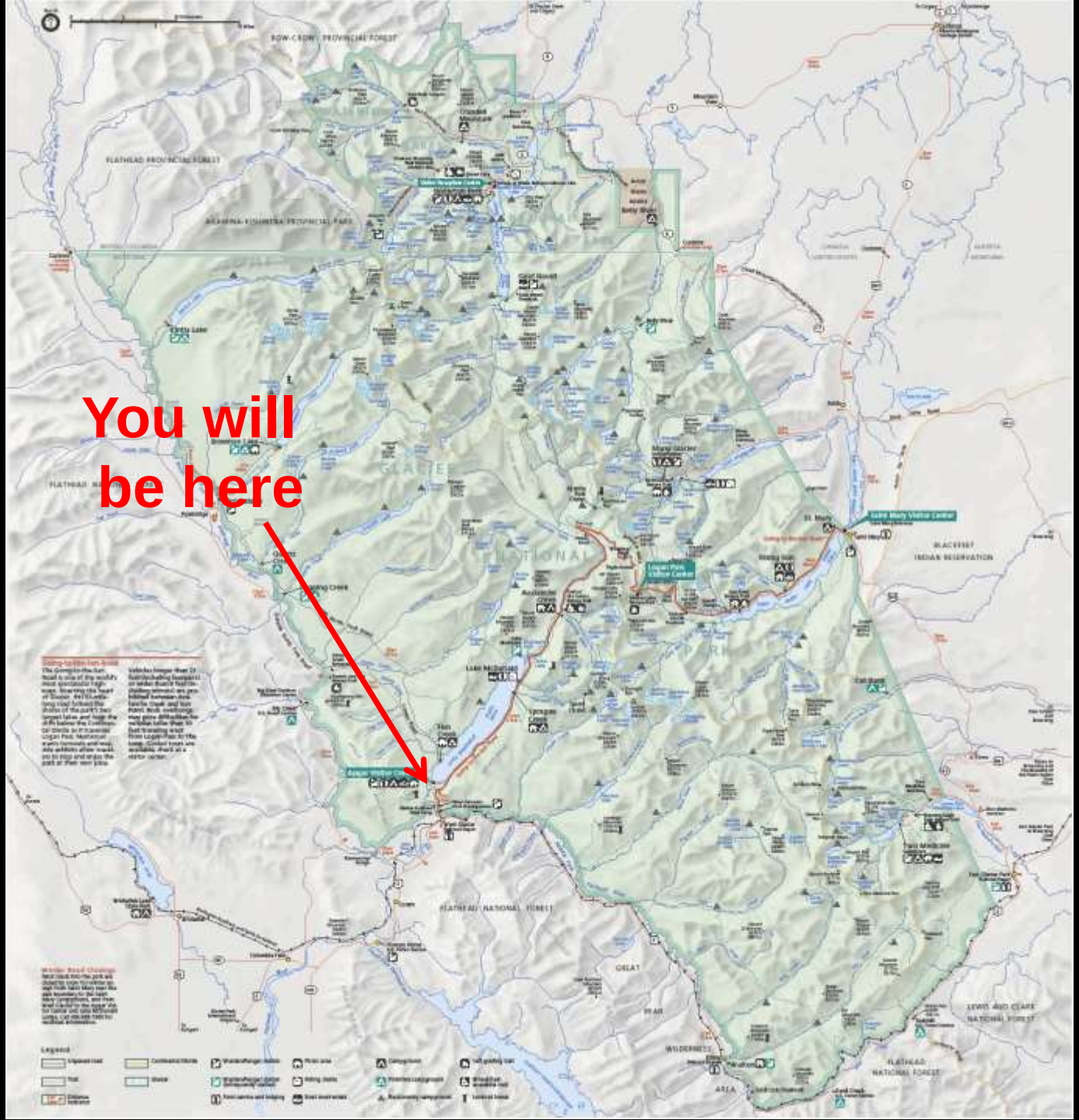




Make sure you center the camera so that the data form fills the entire frame and you don't cut off important data.

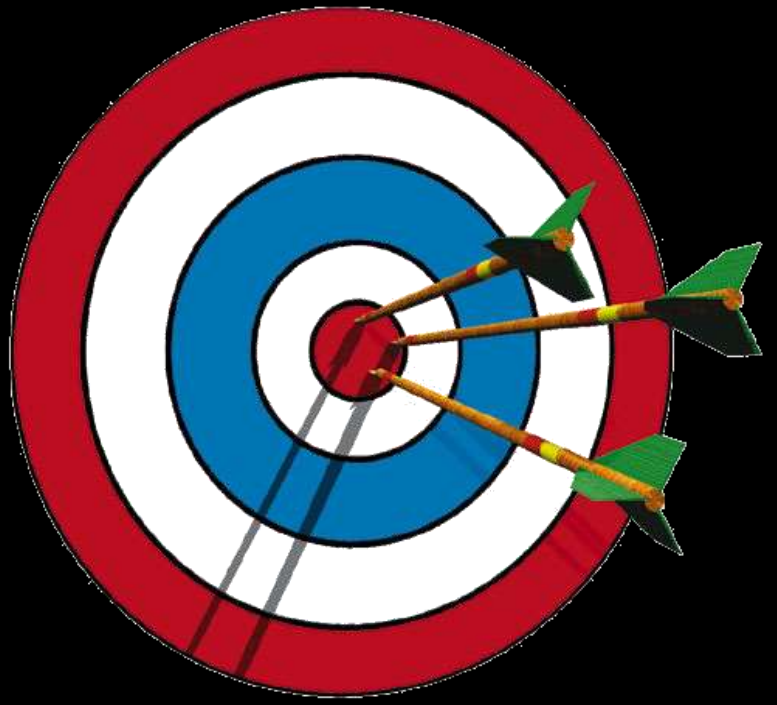
Look at the picture.

Can you read *all* the data?


You will
be here

Do It Right!

Collect and record data carefully. The information you collect will influence decisions about the management of this area.



Why would it be important to be both ***accurate*** and ***precise*** when collecting field data?

Percentage Coverage Practice

Imagine putting a grid over your quadrat sample. Now estimate how much area your ground cover type would take up in your sample if it were all grouped closely together in one area? The piece of wood in this example would be 10% cover. After you've done this for each ground cover category, all the percentages together should add up to 100%. (The next slide has another view.)

Take Another Look (answers on next slide).

How Did You Do?

Bare Rock = 0%

Bare Soil/Gravel = 0%

Moss/Lichen = 25%

Trees = 0%

Grass = 25%

Dead Wood = 12.5%

Shrub = 12.5%

Duff = 0%

Forb = 25%

Time to Make a Change

Once our data collection is completed, we will eat lunch . Then we will decide as a group the area of the site where we will remove as many of one species of the non-native, invasives as possible.

Post-Field Trip

Student_Fire_Data_Charlo.xls [Compatibility Mode] - Microsoft Excel

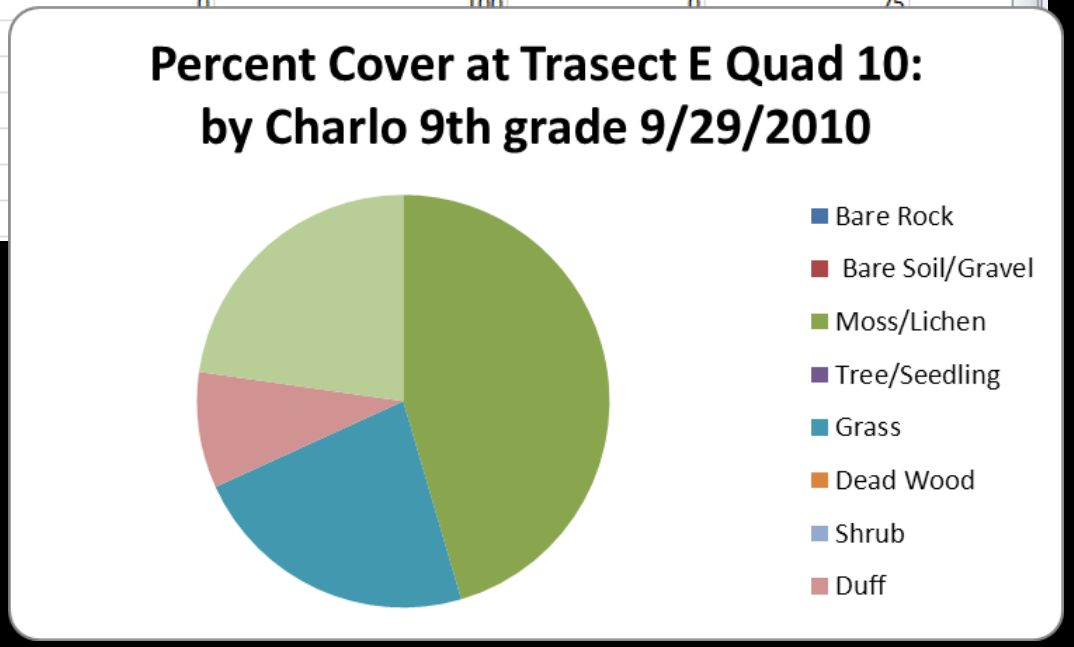
Chart Tools

File | Home | Insert | Page Layout | Formulas | Data | Review | View | Acrobat | Design | Layout | Format

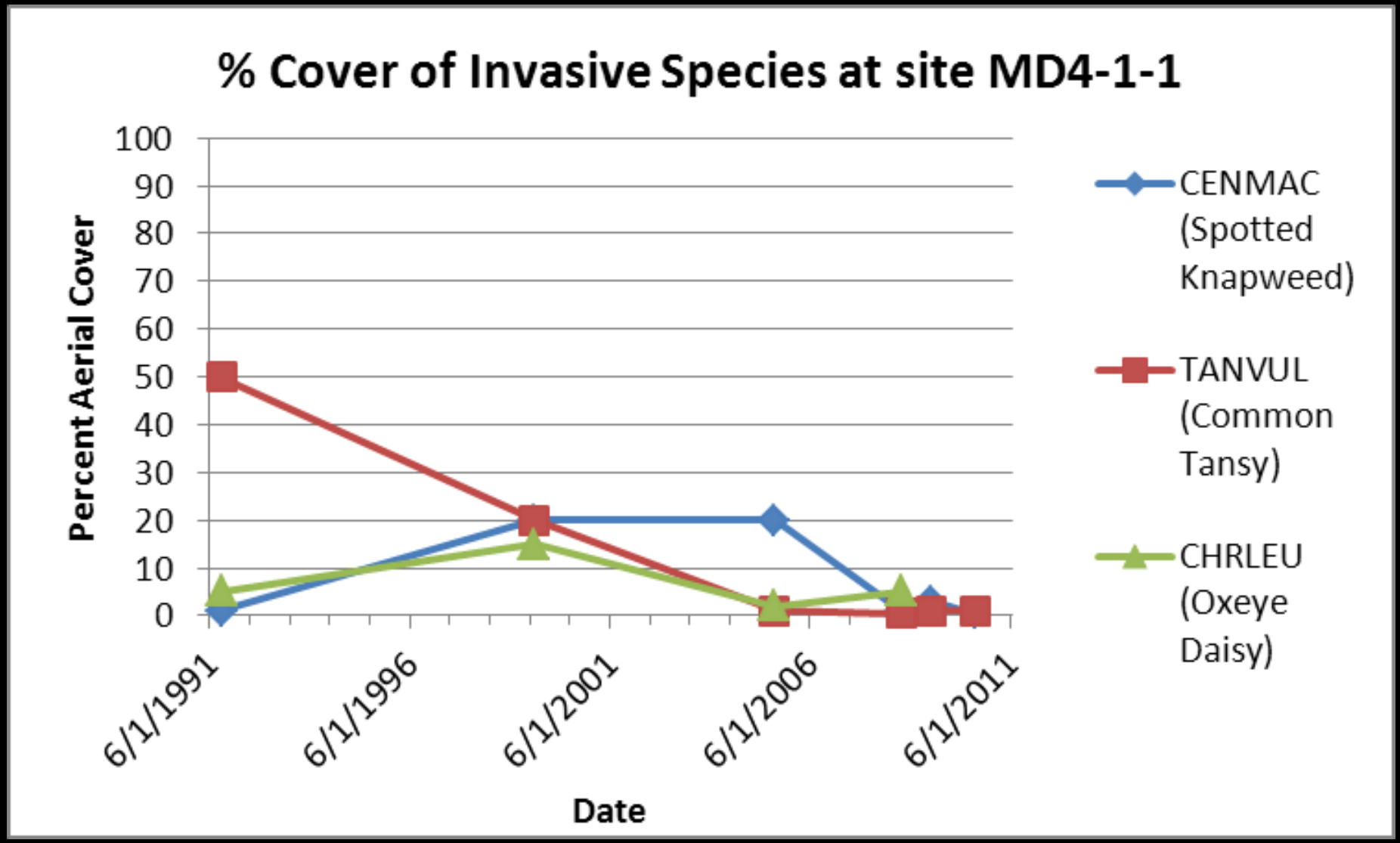
Clipboard | Font | Alignment | Number | Styles | Cells | Editing

Chart 1

	G	H	I	J	K	L	M	N	C
1	6. Transect	7. Quad #	8. Weather	9. Bare Rock % cover	10. Bare Soil/Gravel % Cover	11. Moss/Lichen % Cover	12. Tree/Seedling	13. Grass % Cover	14. Dead
2				Bare Rock	Bare Soil/Gravel	Moss/Lichen	Tree/Seedling	Grass	Dead Wo
3	C	10	Sunny	0	0	10	0	50	
4	C	15	Sunny	0	0	10	0	10	
5	C	20	Sunny	0	0	10	0	50	
6	B	10	Sunny	0	0	5	0	75	
7	B	20	Sunny	0	0	5	0	10	
8	E	20	Sunny	0	0	25	0	75	
9	E	15	Sunny	0	0	50	0	75	
10	E	10	Sunny	0	0	50	0	25	
11	A	0	Sunny	0	0	75	0	50	
12	A	5	Sunny	0	0	100	0	75	
13	A	15	Sunny	0					
14	D	0	Sunny	0					
15	D	10	Sunny	0					
16	C	5	Sunny	0					
17	C	0	Sunny	0					
18	B	0	Sunny	0					

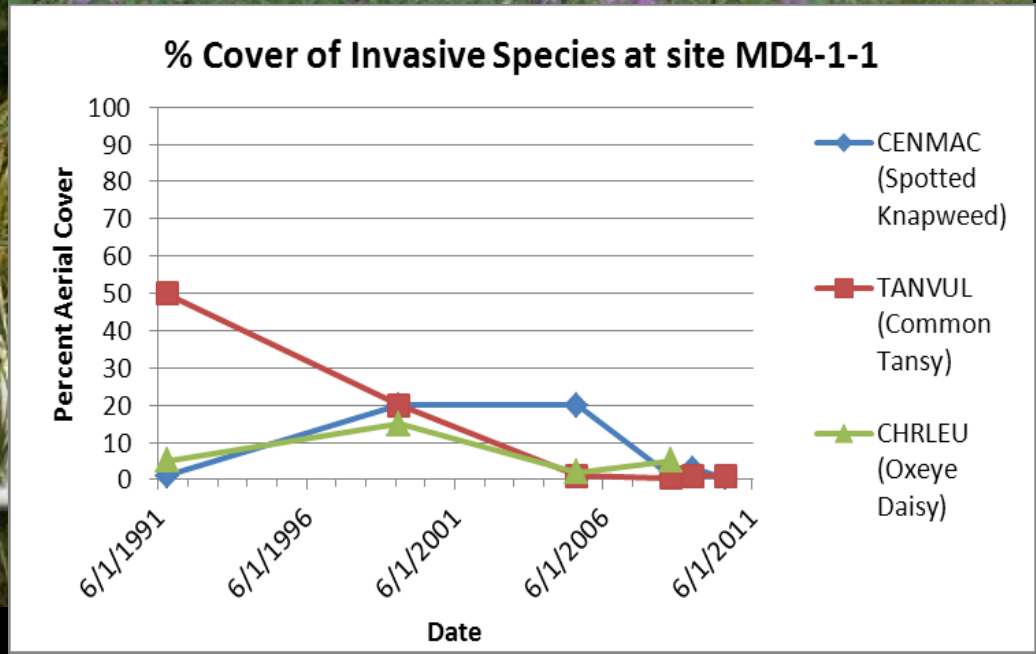


Analyzing Trends Over Time



UNWANTED

INVASIVE SPECIES



Finally, you will have gathered all the pieces you need to draft a

Weed Management Plan

Be Prepared!